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PROCEEDINGS
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Moore, Veranus A. Observations on the Morphology, Biology, and Pathogenic Properties of Twenty-eight Streptococci Found in the Investigations of Animal Diseases. Bulletin No. 3. Miscellaneous Investigations Concerning Infectious and Parasitic Diseases of Domesticated Animals. Bureau of Animal Industry, Department of Agriculture, Washington, D. C., 1893.

The observations recorded in this article extend over a period of about four years and include a careful study of nearly all of the streptococci met with in the study of animal diseases in that time. The delicate nature of these organisms caused many of them to perish before they were sufficiently studied to be included in the list given. The streptococci were isolated from various organs of different species of animals and from animals suffering from a variety of diseases. The primary object of the investigation of these bacteria was to determine to what extent they might be considered responsible for the lesions in which they were found, especially when associated with those morbid conditions which could not be attributed to any specific cause.

The cultivation of these streptococci showed them to be extremely sensitive to variations in culture media and in temperature. The description of the twenty-eight species given is confined to those more hardy cultural characters which repeated cultures showed to be of recognizable differential value. The writer places much stress on the differential importance of the physiological powers of these bacteria and urges more extended study in this direction. He refrains

Description of the

Strepto-coccus.	Source and date.	Accompanying disease.	Length of chains.	Diameter of cocci.	Growth on solid media.		
					Agar.	Gelatine.	Potato.
A	Lung, pig, 1887	Swine plague.	Very long	0 8 μ oval		Feeble	No growth
B	Spleen, pig, 1888	Disease (?)	Long	0.6–0.9 μ	Nuclear†	do	Grayish
C	Lung, pig, 1889	Hog cholera	Short and long.	0.7–0.9 μ	do	do	
D	do	do	do	0.7–0.9 μ	do	do	
E	Spleen, pig, 1889	do	Long and very long.	0.5–0.7 μ	do	do	No growth
F	do	Modified hog cholera.	do	0.7–0.8 μ	do§	do	Thin, grayish.
G	do	Disease (?)	Very long	0.8–1.0 μ	do	do	Feeble
H	Lung, pig, 1889	do	Short	0.7–0.9 μ	do	do	
I	do	Swine plague	Long	0.6–0.7 μ	do	do	No growth
J	Blood, pig, 1889	Modified hog cholera.	do	0.6–0.7 μ	do	do	Feeble
K	Peritoneal exudate, pig, 1890.	Swine plague.	do	0.6–0.8 μ	do‖	do	
L	Liver, pig, 1890	do	do	0.8–1.8 μ	do	do	
M	Spleen, pig, 1890	Disease (?)	do	1.0–1.5 μ	do§	do	No growth
N	Kidney, cow, 1890.	Texas fever	Short	0.8–1.0 μ	do	do	
O	Feces, cow, 1890	Healthy	do	0.8–1.8 μ	Vigorous	Vigorous	
P	Trachea, pig, 1890.	do	do	0.8–1.0 μ	Nuclear	Moderate	
Q	Lung, cow, 1891	Pneumonia	Long	1.2–2.0 μ	Moderate	Feeble	
R	Abscess, knee, pig, 1891.	Chronic hog cholera.	Short	0.7–0.8 μ	do	do	
S	Abscess, elbow, pig, 1891.	do	do	0.7–0.8 μ	do	do	
T	Lung, cow, 1891	Pleuro-pneumonia.	do	1 0–2.0 μ	do	do	No growth
U	Trachea, horse, 1891.	Healthy (?)	do	0.9–1.0 μ	Translucent.	do	Feeble
V	Lung, pig, 1891	Swine plague.	Long	0.7–0.8 μ	Moderate	do	No growth
W	Liver, pig, 1892	Disease (?)	do	0.8–0.9 μ	Nuclear	do	do
X	Blood, pig, 1892	do	Short	0.7–0.9 μ	do	do	do
Y	Spleen, pig, 1892	do	Long	0.7–0.8 μ	do	do	do
Z	Liver, pig, 1892	do	Short	0.8–1.3 μ	Moderate	do	do
α	Blood, pig, 1892	do	Long	0.7–0.9 μ	do	do	do
β	Nasal mucus, horse, 1892.	Glanders	Short	0.9–1.0 μ	Nuclear	do	do

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*The streptococci from Q to β, inclusive, were cultivated in peptonized bouillon containing 2 per cent. glucose in the fomentation tube. Streptococci Q, R, and S did not develop in the closed portion of the tube. The growth in the open bulb was exceedingly vigorous. The others developed in both sides of the tube. The growth was more vigorous but otherwise similar to that in simple bouillon. The alkaline reaction of the bouillon was changed in every case to an acid one during their multiplication.

† There was no formation of pigment in the growth on the surface of agar.

Twenty-eight Streptococci.

Growth in bouillon.*	Reaction.	Bouillon cleared.	Effect on milk.	Stain after—		Pathogenesis.
				Gram's method.	Weigert-Gram method.	
		Days.				
Flakes	....	....	Not changed	Nicely	....	Destroys mice.
F'tly cl'd'd, flakes.	....	10	Thickened in 30 days.	Not stained.	Not stained	Local swelling in rabbits.
Uniformly clouded.	....	26	No change	Nicely	Feebly	No effect.
......do	....	19	......do	......do	......do	Do.
Flakes, f'tly clouded.	....	12	Casein coagulated.	Feebly	......do	Destroys mice and rabbits.
Uniformly clouded.	....	25	No change	Nicely	Nicely	No effect.
Flakes in suspension.	....	12	......do	Feebly	......do	Do.
Uniformly clouded.	....	10	......do	......do	......do	Do.
......do	....	3	Casein coagulated.	Nicely	......do	Do.
......do	....	40	Thickened	......do	Feebly	Do.
Flaky sediment.	....	....	No change	Not stained.	Very feebly	In rabbit elevation of temperature. Local swelling.
......do	....	....	Casein coagulated.	......do	Feebly	No effect.
Heavily cl'd-ed, flakes in suspension.	....	6	No change	Nicely	Nicely	Do.
Turbid	....	(¶)	......do	......do	Feebly	Do.
......do	....	15	Casein coagulated.	Not stained.	Not stained	Do.
F'tly cl'd'd	....	8	......do	Feebly	Nicely	Do.
Flocculent sediment.	Acid‡	....	No change	......do	Feebly	Slight local reaction in rabbits.
Flakes	.....do	....	Casein coagulated.	......do	Nicely	No effect.
......do	.....do	....	No change	Nicely	Not stained	Do.
Uniformly clouded.	Alkaline	8	Casein coagulated.	......do	Nicely	Destroys mice and rabbits.
......do	Acid	4	......do	Feebly	Not stained	Do.
......do	Alkaline	7	......do	Nicely	Nicely	No effect.
F'tly cl'd'd, flakes.	Acid	5	......do	Feebly	Not stained	Do.
......do	.....do	2	......do	Nicely	Nicely	Do.
......do	.....do	4	No change	......do	......do	Do.
......do	.....do	2	......do	......do	Not stained	Destroys mice.
......do	.....do	2	......do	......do	Nicely	Destroys mice, rabbits, and pigs.
Very faintly clouded.	Alkaline	6–8	......do	......do	......do	No effect.

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‡ According to observations recently made by Dr. Theobald Smith, the initial acidity of the cultures of many bacteria is demonstrably due to the presence of muscle glucose in the bouillon. As this varies in quantity and is occasionally absent, the inconstant and conflicting results on the acid and alkaline reaction of cultures is readily explained.

§ An unusually vigorous growth.

‖ An unusually feeble growth.

¶ Several weeks.

from formulating a classification of the streptococci studied, as a review of the classifications already made of this group does not apply to all of the different series of streptococci thus far studied, and it seemed best to accumulate more data before other attempts are made.

Several properties of the streptococci studied were found to be common to them all. They stain readily with the ordinary aniline dyes. They grow in gelatine, but do not liquefy it, and their growth on all of the media used is not viscid. They grow in the ordinary temperature less vigorously than at the temperature of the body. They grow more vigorously in peptonized bouillon containing glucose. The other characters determined are given in tabulated form. For the sake of convenience, the streptococci are designated by the letters of the alphabet.

The words short, long, etc., used in designating the length of the chains are assigned the following arbitrary definite meaning: Very short chains are composed of from 3 to 4 cocci or segments; short chains from 4 to 10 cocci; long chains from 10 to 40 cocci. In the table these terms have reference to the growth in bouillon only.

The morpology is discussed to a considerable length, and the fact pointed out that in most cases the individual elements are ovoid and not spherical. Attention is called to the close similarity that exists between the different species, excepting Streptococcus O which was obtained from the intestinal canal of a cow.

A very curious fact brought out in these investigations is that streptococci isolated from the different organs of the same animal are frequantly so closely related that they cannot be differentiated excepting in one or two of their biological characters. Thus Streptococci R and S were isolated from the pus in the joint abcesses (knee and elbow) of a pig that died of chronic hog cholera and they could not be differentiated except in their effect on milk and in their reaction to Gram and Weigert-Gram staining processes.

The author has studied many streptococci from the mucous membranes of healthy animals, water, etc., and found that they are in some instances quite as delicate in their biological properties as those isolated from diseased animal tissues. He also thinks it possible that these slight variations may be produced by difference in the environment of the streptococci previous to their isolation, and that primarily they were identical.

The pathogenesis of these streptococci was carefully determined, and in one instance repeated inoculations were made in mice to increase the virulence of the streptococcus, but with negative results. Nine of the twenty-eight streptococci showed more or less pathogenic power indicated in the following table. All of the others produced no appreciable effect upon mice and rabbits.

Summary of Inoculation Experiments with the Pathogenic Streptococci.

Streptococcus.	Fatal to—	Time required in destroying life.	Remarks.
A	Mice	2 days	Serous infiltration at point of inoculation; streptococci in spleen and blood.
B			Slight local reaction in rabbits.
E	Mice	2 to 14 days	Spleen and liver hyperæmic; coagulation necrosis in liver when life was prolonged for several days.
	Rabbits (ear vein)	24 hours	Spleen slightly enlarged.
	Rabbits (subcutaneously).	7 days	Local reaction; exudative peritonitis; many streptococci in exudate.
K			Local reactions and elevation of temperature in rabbits.
Q			Slight effect on rabbits; local abscess; no fever.
T	Mice	3 to 4 days	Spleen and liver hyperæmic.
	Rabbits (ear vein)	5 days	Small abscesses in intermuscular tissue.
U	Rabbits (subcutaneously.)	2 days	Spleen and liver hyperæmic; punctiform hemorrhages in colon.
Z	Mice	2 to 4 days	Local reaction; spleen and liver hyperæmic.
a	Mice	3 days	Local reaction; spleen and liver hyperæmic.
	Rabbit (ear vein)	24 hours	Spleen and liver hyperæmic; innumerable streptococci in organs.
	Pig* (in vein)	7 days	Inflammation about right shoulder joint; spleen, liver, and kidneys hyperæmic; streptococci in organs.

* Streptococci A and *a* are the only ones that were inoculated into pigs.

V. A. M.

Moore, Veranus A. A Non-motile Bacillus, Closely Resembling the Bacillus of Hog Cholera, Found in the Lung and Spleen of a Pig. Bulletin No. 3, Bureau of Animal Industry, Department of Agriculture, 1893, p. 31.

In the bacteriological examination of the spleen and lung of a pig that died with a complication of lesions, including pneumonia and a fractured thigh, Moore found a bacillus which at first was thought to belong to the swine-plague group of bacteria, but which proved to be closely related to the bacillus of hog cholera. This bacillus appeared in pure culture from the spleen and in nearly pure cultures (agar plates) from the secretions in the smaller bronchioles. The important feature in connection with this bacillus is its close resemblance to the hog-cholera bacillus in all of its cultural characters, but morphologically it resembles the bacillus of swine plague more closely. It is pathogenic to mice, rabbits, guinea-pigs, and swine. The degree of virulence which it possesses for these animals is greater than hog-cholera bacteria. Its non-motility is the only feature which separates it from the hog-cholera bacillus, and on this account it is not assigned a specific name, although it appears to be a distinct and new species. It may be found that intermediate forms exist which will connect it to one or the other of those species of bacteria which it resembles. The writer thinks that it gained entrance to the body of the pig through the air passages. Although other animals were in the pen with the one from which this organism was obtained, no other deaths occurred. Attention is called to the importance of thoroughly studying all pathogenic bacteria and determining all possible knowledge concerning them before they are placed unreservedly in any species.

V. A. M.

LEPROSY.

(Modern Medicine and Bacteriological Review, 1894, p. 93.)

The rapid development of this disease in the Sandwich Islands and in India and the death of Father Damien resulted in the establishment by the English government of a commission to investigate leprosy. They found that the first case of leprosy in the Sandwich Islands occurred in 1830, sixty-four years ago, since when it has increased until at the present time there is one leper to every thirty healthy persons in these islands, while in India the ratio is 1 to 2,000. By careful inquiry the commission learned that of healthy persons who associated closely with lepers, eating and drinking with them, 700 in 10,000 became lepers. Even the earth trodden by lepers is found to contain the germs of this disease. The commission concludes that leprosy is not hereditary. They believe the soil and air of India have become so charged with the germs of this disease that any person susceptible to it is likely to come in contact with the germs somewhere at some time and become infected.

W. W. A.

ized by the addition of some alkali. Five authors prefer a one per cent. solution of acetic acid to fix the stain. Sterling uses five per cent. eosin in water, clears with eosinated clove oil, and mounts in Farrant's solution, glycerin, or balsam. Six authors use eosinated alcohol for fixing, and some use both methods.

Why would it not be a good plan to give some of our students a dye to investigate before they take up regular histological work, and by seeing the changes it produces in the tissues they would be warned what to expect.

Those of our readers who desire reliable information as to the chemical composition, character, and trade names and varieties of the more usual coal-tar or carbon dyes will be able to find it in one of two books recently published, viz., "Chemistry of the Organic Dyestuffs," by R. Nietzki, translated by Collin and Richardson ; London : Gurney and Jackson, publishers, 1892; 313 pages; and the second volume of "A Manual of Dyeing," by Kuecht, Rawson, and Loewenthal ; London : Charles Griffin & Co., 1893, 500 pages. This last work is very satisfactory, but is paged continuously with volume one, which relates to the art of dyeing in general, there being 905 pages in both volumes.

PURIFICATION OF WATER BY THE ALUM METHOD.

Max Teich, of the Institute of Hygiene of Vienna, has recently made a study of the effect of the addition of small quantities of alum to impure water for the purpose of precipitating its impurities, and finds that while the method offers no objection from a sanitary standpoint, treatment for at least twenty-four hours is necessary to destroy cholera germs, and that the germs of typhoid fever are not materially affected by it.

W. W. A.

Kellogg, Vernon L. The Taxonomic Value of the Scales of the Lepidoptera. The Kansas University Quarterly, July, 1894, pp. 45 to 89. Illustrated.

Beginners in the use of the microscope usually find some of their most entertaining objects among butterfly scales. The above article is one of the most exhaustive that has been written on them. The keynote of the article lies in the suggestion by Prof. J. H. Comstock, that the student begin with the study of a single organ; that he should ascertain all its variations in structure, both fossil and recent, then consider its functions, and when several of the organs of a given group of forms have thus been studied a comparison of the results will guide to a consistent history and classification of the group. Butterfly scales are well known to be oval, attached to the membrane of the wing by an obtusely pointed pedicel arising from the narrower end of the oval. The margin may be entire or show dentations of varying depth and number. When the teeth are long and slender, the term "fingered" is applied to them. They vary in size from .07 mm. in *Micropteryx* to .8 mm. in *Castnia* sp., if we exclude scale hairs and those on the outer margin of the wing, which are always unusually long and slender. In width they vary from that of a hair to .4 mm., as in *Castnia*. They are often striated very regularly longitudinally, the distance between the striæ varying from .0007 mm., as in *Morpho* sp., to .004 mm., as in *Callidryas cubule*. The scales cover both sides of the wings; the arrangement is often very uniform; the pedicels are directed toward the base of the wing in subparallel rows inserted at approximately equal distances apart; each row consists of an upper and under tier, the scales of the upper tier alternating with those of the under, and each upper scale overlapping laterally two under scales. There is thus formed a complete covering and sometimes almost a double covering. Rows on the under side of the wing bear no relation to those on the upper in arrangement. The pedicels fit into conical cups or depressions averaging about .008 mm. in depth. The number on a wing is enormous. On the wings of a Morpho it may be estimated at 1,500,000. Landois thinks that the pedicel cup consists of a short tube split down one side, in which the pedicel is held by the elasticity of the tube. He thinks this develops by the young scale in its sheath pushing through the hypoderm and pressing one of its cells to one side. This cell thereby acquires a half-moon shape, which as it grows gradually encircles the pedicel, but the edges of which never unite, thus forming the slit. The lower end, however, by the pressure of surrounding cells, grows together somewhat, and, the whole becoming chitinised, we have the pedicel socket. In some cases the pedicel slightly enlarges in such a way as to form a species of ball-and-socket joint, and they are generally more firmly held when alive than after the insect is dead.

The scales are flattened sacs, composed of two membranes, enclosing sometimes only air, sometimes granules of coloring matter, and during life perhaps in some cases a pulp. The striæ are confined to the outer membrane, above which they are raised, and are probably folds in that membrane. Sometimes there are two sets of striæ, one coarse, with intermediate finer ones. There are also in some species cross-striæ, which lie between the longitudinal ribs and do not usually intersect them. According to McIntire, the beaded appearance is due to, 1, corrugations taking the form of hemispherical embossing; 2, pigments; 3, shadows of projections or folds in the membrane, either within or beyond the focus of the object-glass.

Primarily the scales serve to protect and strengthen the wing membranes. Cross-veins are rare in the Lepidopterous wing, though common in other orders. I consider the flattened symmetrical scale, with short, stiff pedicel and broadly expanded, irregularly corrugated and striated blade, the more specialized form of scale, while the slender, flexible, hairlike form is the more generalized condition; also, a regular arrangement may be considered a more specialized condition than an irregular one. The heavy flyer has a less specialized scale-covering than a swift flyer. The scale is to be considered simply as a modified hair. Semper gives three stages in the wing development: First, the epidermis of the body pushes out in the form of a double plate; then, secondly, a membrane separates the lumen of the wing from the epidermis, which lies against the membrane. Soon after this primitive membrane has become fully developed, the epidermis, whose cells have become large and cylindrical, draws away from the membrane, leaving a space between it and the membrane. In this space the development of scales begins. At short intervals there are large spherical cells, with large nuclei, and which bear, without exception, an elongate process which pushes out between the epidermal cells and at first appears as a long stalk, which suddenly widens into a more or less spherical bladder. This bladder, at first large and irregular in outline, is the first suggestion of the future scale. The dependence of sharply defined color markings on specialization of the scale is marked. In the lower moths, where scale specialization has not proceeded far, we rarely find such sharpness of color as among the butterflies, where specialization is at its existing limit. The colors of scales are produced by pigments or by interference of the waves of light, due to reflection through the laminæ and striated surfaces. As pigments mostly transmit the same colors as they reflect (the colors complementary to those they absorb), the colors of pigmented scales are usually the same by transmitted as by reflected light. This is not so in the case of colors by interferonce (optical colors). The scales producing these colors are often transparent, and when viewed by transmitted light are colorless, or they contain pigment, and when seen by transmitted light have a color due wholly to the pigment and not at all to the lamination and striation, so that it may be entirely different from the colors seen when the scales are viewed by reflected light. These interference colors are the brilliant metallic or iridescent tints common among butterflies as *Morpho* and *Lycæna*. It is rare they constitute all the colors of a wing.

As the color-markings exist among Lepidoptera for protective resemblance or for attractive ornamentation, day fliers present a more special development, and the clear spaces in certain wings are to be explained by considering them as a specialization by degradation for ornamental purposes.

Scales of a peculiar shape and structure, smaller than ordinary scales, and found on the wings of the males of some species, form the external openings of scent glands. They have been called "plumules," "battledore scales," and lately "androconia." A distinctly pleasing aromatic fragrance is apparent on rubbing the wings of the imported but common cabbage butterfly (*Pieris rapæ*, L.) with the fingers and smelling of them. In order to act as scent organs, the androconia are still connected with the living tissues, while the ordinary scales are not, and the scent apparently passes up through the pedicel of the androconium from the scent gland and is dissipated from the feather tip or the scattered openings of the scale. Besides this function, scales produce sound by stridulation. *Vanessa antiops* has been heard while fanning its wings, and the sound may be produced by rubbing the wings together after the insect is dead.

Much of the paper is devoted to showing the value of scales in taxonomy. There is no bibliography, but most of the important papers cited are referred to by full titles. W. H. S.

Tilden, Josephine E. On the Morphology of Hepatic Elaters, with special reference to Branching Elaters of *Conocephalus conicus*. Minnesota Botanical Studies, Bulletin No. 9, Minneapolis, Minn., March 21, 1894, p. 43. Illustrated.

A very thorough review of the literature of the subject is given, with discriminating remarks. The general description of Leclerc du Sablon is adopted, according to which the sporogonium of the typical Hepaticæ is composed of sixty-four cells at first, each subsequently making four. These cells elongate in the direction of the axis of the sporogonium and differentiate in two kinds. In one the nucleus undergoes repeated bipartitions, and these give rise to the spore mother-cells. In the other kind the nucleus does not divide, and the protoplasm forms spiral granulations; these become the elaters. The two kinds of cells are equal in number, each alternating with the other. The branching of elaters of any kind has hardly been touched on; a very few have been figured. *Conocephalus conicus* was particularly studied. In some sporogonia one-fourth of the elaters were branched. The normal elater cell is short, thick, and geniculate in this species. It secretes on its inner surface a thickened band of a brownish color, which winds spirally round the cell. This band generally branches shortly after leaving the end of the elater, and one or both of these strands may branch a second time. In most cases the branches fuse again at the opposite end, so that in general each end is occupied by a single loop, while its middle portion contains three, four, or five strands parallel to each other.

1. So far as known, the young elaters of liverworts always contain starch. In most cases it disappears as the spiral bands are formed, but it may also be present in mature elaters. Aside from this substance, no cell contents have been observed.

2. The branching of elaters is known to take place in Targionia, Anthoceros, Radula, and Conocephalus. It is probably more general.

3. In the case of Conocephalus, at least, the branching follows a dichotomous order. It may be explained as due to the radial arrangement of the elaters within the sporogonium, from which the two ends of the elater come to have different capabilities.

4. The conditions of branching may be said to depend upon three circumstances: (1) the shape of the sporogonium; (2) the

arrangement of the elaters with reference to their mutual pressure; (3) the structure of the elater.

5. The branching does not take place until the pressure within the sporogonium is relieved by the loosening up of the spores and elaters preparatory to their being set free. Therefore the branching is analogous to the phenomena of thyloses.

6. The number of spiral bands in the walls of elaters varies from one to five. These undergo branching and fusion.

7. The normal elater of *Conocephalus conicus*, as a rule, contains two spiral threads, one or both of which generally branch.

8. The abnormal branching of the elater causes abnormal branching of the spiral threads.

The data on which this paper is based were gathered in the morphological laboratory of the University of Minnesota.

W. H. S.

Pound, Roscoe A Revision of the Mucoraceæ or Moulds with special reference to Species Reported from North America. Minnesota Botanical Studies, Bulletin No. 9, June 9, 1894, pp. 87–104.

This was written in part for the forthcoming Flora of Nebraska. Eighteen valid genera are accepted, against twenty-nine in the *Sylloge fungorum*, nine of which were described from insect eggs, slime moulds, or Hyphomycetes by the older botanists. Full details of classification, synonymy, and descriptions of species are given.

Tilden, Josephine E. List of Fresh-water Algæ collected in Minnesota in 1893. Minnesota Botanical Studies, Bulletin No. 9, January 16, 1894, pp. 25-31.

Campbell, Douglas H. On the Relationships of the Archegoniata· Botanical Gazette, xvi, pp. 323–333, Dec., 1891.

The genetic relationships between the *mosses, ferns,* and gymnosperms and their probable ancestry are discussed. The higher Confervaceæ, such as Colochæte, probably resemble the ancestral forms of the Archegoniata more nearly than any living forms.

The author bases his conclusions upon a study of the development of the different forms, coupled with such evidence, meager and fragmentary in the case of these plants, as the palæontological records have to show.

Of Bryophyta there are two classes, the liverworts and the true mosses. Strong reasons exist for considering the former the more primitive. The thalloid Jungermanniaceæ are to be regarded as the most primitive of living forms, and not the Ricciaceæ, which are usually so considered. The primitive liverworts were thallose forms not unlike such existing forms as metzgeria or the prothallium of Osmunda, and from this these stocks diverged—the Ricciaceæ (including Marchantiseceæ), the Anthocerotaceæ, and the foliose Jungermanniaceæ. Sphagnum forms a link between Anthoceras and the true mosses. The Ophioglossaceæ is nearest the ancestral form of all the Filicineæ. The Osmundaceæ stand about midway between the Ophioglossaceæ and the Filicineæ. The author closes his highly suggestive and instructive paper with a discussion of the origin of the Angiosperms. The demonstration of their origin is not possible from the data at hand.

W. W. R.

Campbell, Douglas H. Notes on the Apical Growth in the Roots of Osmunda and Batrichium. Botanical Gazette, xvi, pp. 37–43, pl. v., Feb., 1891.

The species of Osmunda studied were *O. cinnamomea* and *O. claytoniana;* of the genus Botrychium, *B. ternatum* and *B. virginianum.*

"The roots were fixed with a one per cent. aqueous solution of chromic acid, or, in some cases, with Flemming's chrom-osmic-acetic acid mixture; but the former was found to give the best results. After thoroughly washing to remove all traces of the acid, and then dehydrating, the specimens were brought gradually through turpentine and then imbedded in paraffin and sectioned on a Minot microtome." A solution of Bismarck brown in 70 per cent. alcohol was found most effective in staining young cell-walls. The author compares his own observations upon the above-mentioned species of Osmunda with the conclusions of Bower (Ann. Bot. iii, 1889), and also with those of Van Tieghem and Douliot (Ann. des Sc. Nat. Bot., viii, pp. 378–380, 1888). Instead of departing from the single apical cell type of the Equisetaceæ and the true ferns, as Bower shows in the species he studied, Professor Campbell found that the growing point of the root of *O. claytoniana* conformed to it so far as there being a single apical cell. This cell, however, was four-sided, and not the same regularity could be observed in the successive divisions as in the true ferns. Nevertheless, the divisions were much more regular than in *O. regalis* or *O. cinnamomea*, and, except for the irregularity in the formation of the root cap, correspond very regularly to the regular fern type. The primary tissue systems, too, are better differentiated.

The principal differences between the root structure of *Botrychium virginianum*, and *B. ternatum* are (1) the former in cross-section shows much more regularity in the position of segments; (2) the root tip is flatter; (3) the stratification of the root cap is more evident, although much less so than in the Filices. In the concluding remark a hint is thrown out as to the genetic relationships of the species of Botrychium. *B. virginianum* is considered as approaching most nearly to the true ferns.

W. W. R.

Carlton, M. A. Occurrence and Distribution of Uredinæ. Science, vol. xxii, p. 62.

Parasitic fungi are affected in distribution chiefly by temperature and moisture. They may be reproduced annually for several years, disappear for an indefinite period, and reappear after certain intervals of time. In Kansas, east of the 96th meridian, Æcidia number about fifty and teleutospores of all genera sixty-five, while west of the same meridian the proportion is twenty-three of the former to fifty of the latter. All Uredinæ are probably more abundant in wet seasons than in dry, and in warm than in cool seasons. This season, 1893, has been hot and moist, unusually favorable to rusts. In 1877 northern Kansas suffered from a severe rust scourge. Sulphur-like clouds of spores filled the air, and I think probably from *Puccinia graminis*, Pers., though *P. rubigo vera* is more common every year, but seldom attacks the stem. Nine species have not been reported for several years, two appear to be working eastward and five westward, while it is remarkable that a number of species known on certain plants in western Kansas are entirely absent in the east, though the same plants are abundant.

W. H. S.

FORMALIN—ADDENDA.

Since going to press with the article on formalin in the preceding number of the Proceedings, further observations on its action on albumen has demonstrated the fact that it does readily coagulate serum albumen, but the action on egg albumen appears to be but slight. When added to a highly albuminous urine, whether in full strength or dilute solutions, a precipitate occurs, the flakes being somewhat larger than when heat is the precipitant. It therefore is apparent that formalin cannot be used as a preservative for highly albuminous urines during transportation or otherwise, if the sample is to be agitated. Even here, however, it may be added to the urine in deposit glasses. Being heavier than the urine, it quickly sinks to the bottom, and if carefully added and allowed to trickle down the sides of the glass, the subsequent examination of the deposit is in no way interfered with, crystals and formed elements retaining their normal appearances. Left in contact with egg albumen, a slight percentage only becomes opaque, the greater bulk retaining its consistency and transparency.

A recent newspaper article states that this new germicide and preservative is being used for the preservation of edibles, according to a report to the State Department from the United States consul at Bavaria. In reply to an inquiry, the department informs me, under date of July 31, that their report is from Louis Stern, Esq., commercial agent at Bamberg, who quotes from the Technical Journal, issued by the Bavarian Polytechnic Society. I addressed the department to learn whether they were in possession of any reliable information relative to the physiological action of formalin, believing that if it could be used with impunity as a preservative for edibles there could certainly be no valid objection to its use as a topical application in an amply sufficient strength of solution to insure the destruction of bacteria in any local bacterial lesion accessible, and that it possibly might also be used as an intestinal antiseptic.

But they reply that Mr. Stern says that on account of its poisonous properties it cannot be taken internally, either in concentrated or weak solutions; but if meal, game, fowls, fish, &c., be dipped into a solution of formalin they will remain fresh for a long period without getting a disagreeable taste or odor of decay; that regarding the use of formalin in the preparation of butter and cheese sufficient data have not as yet been secured, but it has been shown to be very well adapted for cleaning the vessels and machinery employed in dairies, and that it is of special importance for slaughter-houses and meat shops, for preserving fish during transportation, and fruit, the latter being dipped or placed for a short time in a weak solution of the chemical.

While the above does not throw any new light on the physiological action of formalin, it seems to indicate that food treated with the solution does not retain any poisonous qualities that it may acquire. Formalin evaporates quite rapidly, leaving deposited on the article to which it has been applied a white coating possessing the peculiar penetrating odor of the gas, and which in the course of a few hours is completely volatilized and dissipated. Probably this explains why edibles treated with the solution do not retain the poisonous qualities acquired. So long as any of the deposit might remain upon the articles I should hesitate to use them for food, and I should think that where it is practicable it would be better to merely expose edibles to the action of the vapor, if it is to be used as a preservative.

In the case of sponges, bandages, &c., for surgical operations the property just mentioned is a valuable one. In view of it, it is not only possible to thoroughly sterilize such articles and to keep them sterile, but the material deposited upon them, upon the evaporation of the solution in which the articles were soaked, would by virtue of its volatility keep them surrounded by an atmosphere charged with the gas and keep up the sterilization.

W. W. A.

FORMALIN.

In a brief article by W. McA. Eccles (Brit. M. J., Lond., 1894, vol. i, p. 1124) the author draws special attention to some of the peculiar advantages of this hardening agent in the preparation of tissues for histological demonstration. One of its chief advantages to the busy worker in normal and pathological histology is the great saving of time. This is especially true in microscopical pathology. Tissues removed for the purpose of diagnosis are too often imperfectly examined on account of the length of time required for the proper hardening, cutting, staining, and mounting. Fresh sections are difficult to prepare by most of the rapid methods, and are decidedly unsatisfactory. The more common fluids used for the purpose of fixing and hardening, such as alcohol, Müller's fluid, etc., require more time than can be spared where an early diagnosis is desired. Absolute alcohol for hardening purposes, even with tissues of small bulk, requires from twenty-four to thirty-six hours time, and then the tissues suffer more or less shrinkage and contraction. Methyl alcohol requires a much longer time, with the same result, while the chromates still longer time, and with the disadvantage of interfering to some extent with the proper staining of the tissues.

Any agent which tends to shorten the period of time necessary for the proper fixing and hardening and which will give satisfactory results from stainingagents is to be welcomed in the field of histology. While form aldehyde possesses some advantages over the above-mentioned agents, being extremely powerful and having a very rapid hardening effect, it does not possess all the properties desired for this class of work. At the present time it is being largely used in the preparation of tissues for normal and pathological histology, and excellent results have been obtained by its use upon brain tissue, lung, and glandular tissues in general, and for the demonstration of the ciliated epithelium of the trachea. According to the researches of this author the tissues do not become brittle; they all stain with beautiful definition in the ordinary stains—carmine, hæmatoxylon, the anilines, etc.—and the cells are not altered in shape or character. Pathological tissues are placed directly in a 40 per cent. solution of the formalin, and, as a test for the all-around hardening properties of this agent, small, soft, round-celled sarcoma, adenoma, and emphysematous lung were subjected to the experiment. Forty-eight hours were sufficient for the perfect hardening of this class of tissues. Compact growths, such as scirrhus or renal tissue, required but half this time, and a solution of 10 per cent. strength. The author's rule, so far as the strength of the solution is concerned, was to employ 40 per cent. for very soft, 20 per cent. for firmer, and 10 per cent. for firm, compact tissue, when the hardening is most rapid and satisfactory.

J. M. L.

Woodworth, C. W. **A New Idea in Microscope Construction. Science, August 4, 1893, p. 59.**

To secure better means of orientation with medium and low powers the writer had a microscope constructed with an ordinary revolving mechanical stage supported on a rotating bar, like a substage bar, and provided with a rack and pinion adjustment. The stage is centered in the usual way, which brings the axis of revolution coincident with the optical axis. The stage bar swings upon a core which is adjustable laterally, so it becomes possible to make the axis of its rotation intersect the optical axis. In using the instrument the tube is brought to a certain position, and the focussing of the object accomplished by the rack and pinion of the stage bar. The correct position of the tube is determined by trial for each objective, and marks made on the tube to indicate this position. Different objectives have different optical axes, and a centering nose-piece is essential. The instrument has proven to be all that could have been expected as an orienting microscope, while its value for ordinary work is in no way decreased. Plans have already been completed for a similar dissecting instrument, involving even greater changes, to dissect insects under water. The objective will be provided with a hard rubber shield having a cover-glass on the end. It is also expected to be useful in studying aquatic forms.

W. H. S.

SURGICAL CLEANLINESS.

The disinfection of the hands and of instruments, towels, and sponges is a much more difficult operation than is commonly imagined. C. B. Lockwood, F. R. C. S., assistant surgeon to St. Bartholomew's Hospital, after careful bacteriological tests, concludes that for the hands the best treatment is to soak them for a minute or so in a 1 to 1,000 solution of corrosive sublimate in rectified spirit, after having trimmed the nails and scrubbed the nails and hands thoroughly in hot water and soap with the aid of a nail-brush (that has been sterilized by steam for half an hour). When opened out (but not when folded) towels were thoroughly sterilized by exposure to streaming steam for half an hour. Soaking in carbolic acid and other chemicals in the strength usually employed was by no means always effective. For sponges he recommends soaking in hydrochloric acid (1 dram to 1 pint of water) for twenty-four hours; then washing in hot water; then soaking for half an hour in solution of common washing soda (1 dram to 1 pint of water); that they be again washed in hot sterile water; then immersed in cold sulphurous acid (1 to 5) for twelve hours, and finally squeezed out and placed in 1 to 20 carbolic acid until required. This treatment, if properly carried out, removed the sand, bits of shell, fat, etc., and secured aseptic sponges.

From my own experience and the reports which come to me of the use of formalin I believe it also will be found to be a safe as well as convenient agent to use for the above purposes. The mode of application will be to soak the hands, after the preliminary use of hot water, soap, and nail-brush, for a few minutes in a one per cent. solution of formic aldehyde, and to keep towels and sponges in such solution or in a chamber (covered dish) in which the gas is disengaged. W. W. A.

Kellogg, Dr. J. H. The Dangers of Milk. Modern Medicine and Bacteriological Review, vol. iii, p. 95.*

From observation, however, we are led to believe that most mothers, perhaps most physicians also, place too much confidence in the sterilization of milk, whether it is thoroughly boiled or submitted to the method known as Pasteurization. Neither the Pasteurizing nor the boiling of milk destroys all the microbes which it contains. Even when kept on ice, milk which has been thoroughly boiled, after two or three days gives evidence of decomposition, which can be readily detected by the smell or taste. This is, of course, due to the fact that the spores of microbes capable of setting up decomposition processes in the milk have survived the process of sterilization.

A more minute examination of milk will show that within six or eight hours, under ordinary conditions, there is found to be a decided increase in acidity. The period when acidity is first noticed may be said to be the end of the period of incubation for the living spores contained in the milk, as the acidity is evidence of the growth and bacteriological activity of the germs.

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* The results of the card inquiry showed that more interest is felt by members of the Society in bacteriology than in any other branch of microscopy. At the same time it is one of the most difficult to handle in the matter of abstracts. A little experience will be necessary before the proper selection can be made of the articles really new and valuable from the great mass of repetitions and unimportant statements, often not well founded, which are published.—W. H. S.

When germs begin to grow, they will begin also to multiply and increase with very great rapidity. It is hence apparent that if the purpose of sterilizing milk is to diminish the number of microbes which it contains, then sterilized milk is wholesome only during the period of incubation and before acidity appears. It is, of course, possible to prolong the period of incubation indefinitely by repeating the sterilizing process at sufficiently frequent intervals, or by reducing milk to a temperature at which microbic activity cannot occur.

Every mother who is feeding a young infant with cow's milk should be supplied with litmus paper, by which the acidity of milk may be tested, so that she may know when the food administered is of a character more likely to result in disease than in healthy nutrition. The perils to which infants fed upon cow's milk are almost universally exposed are evidenced by the great fatality which attends the artificial feeding of young children.

Dr. H. C. Plaut, of Leipzig, found, as a rule, that fresh milk delivered in the morning in the cities has already advanced beyond the period of incubation, and is unfit for use by young children. Of forty-seven infants whose supply of milk was carefully investigated, eighteen experienced digestive disorders and six died. In some instances the milk was examined before the illness of the infant, and in every case was found to be unfit for food. In most of the entire number of cases the milk was found to be bad. It was mentioned as good in four cases. He states that the investigator insists that the principal cause of digestive disorders in young children and the bad nutrition so often seen in these cases are not to be found in the character of their homes or the care which they receive, nor in the bad conditions to which the milk is subjected after it is purchased, but in the bad handling of the milk before it is sold. Dr. Plaut suggests the enactment of a law requiring that it should be cooled immediately after being received from the cow, even at the stable, which he thinks quite as important as that the home of the child should be maintained in a sanitary condition.

W. W. A.

Kellogg, Dr. J. H. The Relation of Recent Bacteriological Studies to the Etiology of Typhoid Fever. Modern Medicine and Bacteriological Review, vol. iii, p. 5.

The following conclusions are arrived at concerning the above subject:

1. The *bacillus coli* and the bacillus of Eberth are so nearly identical in the logical characters that none of the numerous methods proposed for distinguishing them can be relied upon as giving constant results.

2. The *bacillus coli* gives in inoculation experiments identical pathological effects with those produced by the bacillus of Eberth.

3. The *bacillus coli* acquires, by passing through the body of an animal, biological characters closely resembling those of Eberth's bacillus. The *bacillus coli* found in vaults is much more virulent than the *bacillus coli* of the intestines or Eberth's bacillus.

4. The *bacillus coli* is much more resistant than the bacillus of Eberth, and thrives in vaults, while the bacillus of Eberth quickly dies under the same conditions (in from one to two weeks).

5. The study of epidemics and the bacteriological study of waters which have given rise to typhoid fever lead to the conclusion that the *bacillus coli* at least shares with the bacillus of Eberth the property of producing typhoid fever under certain circumstances, and that the bacillus of Eberth may be only a variety or modified form of *bacillus coli*.

6. The contamination of milk with the excreta of cows is a possible source of infection with the *bacillus coli* and with typhoid fever.

7. The same care ought to be observed in the protection of water used by cows kept for milking purposes from contamination with excreta as that used by human beings for drinking purposes.

8. Since vaults and cesspools constitute depots in which the comparatively innocuous *bacillus coli* acquires malignancy and virulence, rendering it highly destructive to human life, these convenient nuisances should be prohibited by law, and the destruction or disinfection by proper agents or conveyance to a safe distance from human habitation of all alvine discharges should be compulsory as one of the most important means of conserving the public health.

W. W. A.

Ledoux-Lebard, Dr. The Action of Light on the Diphtheria Bacillus. Modern Medicine and Bacteriological Review, vol. iii, 1894, p. 92.

The conclusions arrived at are as follows:

"1. The action of diffused light does not prevent the development of cultures of the diphtheria germ, either at a temperature of 95° or at ordinary temperatures. The direct rays of the sun arrest the development of the germs and sterilize the culture medium in a few days. Diffused light has no bactericide power in relation to bacilli in neutralized bouillon, but has a marked bactericide power in relation to diphtheria bacilli in distilled water.

"2. Diffused light kills dry cultures of diphtheria spread in thin layers in less than two days (twenty-four hours' exposure to light).

"3. The direct light of the sun acts in the same manner as diffused light, but with greater rapidity.

"4. The bactericide power of light in relation to the diphtheria bacillus is due almost entirely to the most highly refracted rays of the spectrum.

"5. The less refracted rays of the spectrum have little or no bactericide power.

"6. Light, by virtue of its bactericide power, sterilizes in less than two days the bacilli of diphtheria, either moist or dry, and hence is a prophylactic agent against diphtheria.

"7. In diphtheritic membranes exposed to the light many of the bacilli are reached by the light only after it has lost a part of its intensity, and hence retain their vitality and virulence for a long time.

"8. Light may be utilized in the disinfection of places contaminated by diphtheria.

"The persistence of the virulence of the germs of diphtheria is well known, but a careful study of the classical examples of extreme persistence of this virulence shows that in a majority of cases the contaminated object had remained a long time protected from the light. In one case, for example, a brush which had been used for making applications to the false membrane of a child communicated diphtheria to the father four years afterwards, having been in the meantime wrapped in paper and placed in a drawer. In other cases the means of contamination has been clothing which had been worn by a diphtheritic patient, and which had been protected from the light in a chest or closet. In still other cases the disease has been communicated by the secretions of the diphtheritic patient, who soiled the floor, and thus the germs were permitted to enter into the cracks between the boards. The prolonged exposure to the sunlight of objects which have been in contact with diphtheritic patients far from any human habitation is an excellent means of rendering certain the action of disinfectants, properly so called, although this action is less rapid than in the case of measles or scarlatina."

It would be interesting to know why diffused light has a bactericidal action on the diphtheria bacillus in distilled water and not in bouillon, and whether lack of pabulum has not something to do with the result. Such is apparently not true of the *bacillus tuberculosis,* for it is a common laboratory maxim that cultures of this germ, whether in glycerine, agar, or bouillon, must be protected from the light if any development is expected to take place.

It must not be inferred from the wording of the above abstract that the author's observations stand alone as to the effect of diffused light on bacteria, nor that the action is the same upon all micro-organisms. Koch has heretofore shown that diffused light is fatal to the *bacillus tuberculosis* in from five to seven days, and direct sunlight in from one to several hours, according to the thickness of the film of sputum, while they retain their virulence in the dark corners of rooms that have been inhabited by tuberculous patients for many months after the cessation of such occupancy, and similar results are reported for other bacteria by Janowski, Buchner, Marshall, Ward, and others. Some of the bacteria seem to be but little affected by diffuse light, and in the case of some of the chromogenes no development of pigment takes place unless the cultures are exposed to light. The action of light seems to be more intense on spores than upon the bacteria themselves. One of Ward's methods of experimenting was by pasting a cross or paper letter over the culture dish and noting the absence of growth in the exposed portions of the medium and its appearance in the part protected by the paper. The possibility that the effect of light, particularly bright sunshine, might be due to the heat and not to the rays of light has been excluded by appropriate tests. W. W. A.

Slater, Prof. Charles. The Bottled Waters of London: To what extent will their use offer safeguards against water-carried infectious diseases? Jour. Path. and Bac., June, 1893.

The waters examined were river, deep-well, artesian-well, distilled, and boiled. The boiled waters were filtered through porous iron, the others through charcoal, before being aërated.

All were found to contain bacteria, the number ranging from nearly three thousand to a very few in each cubic centimeter. The largest number were bacilli. Micrococci were present in much fewer numbers, while yeasts were only occasionally met with. The number of molds varied greatly. The constant and most conspicuous were certain varieties of *B. fluorescens liquefaciens* and *B. luteus*. Other organisms met with were *M. aurantiacus* (at times in considerable numbers), *B. flavus liquefaciens*, *Sarcina flava*, *B. subtilus*, and a large non-liquefying motile bacillus.

Since these organisms could not have resisted the boiling of the water, and since the source of supply did not appear to produce very marked differences in the number of bacteria present in the various samples, their presence must be largely accounted for by the lack of sufficient attention to the cleansing of the bottles, corks, etc.; but there would seem to be no valid objection to the presence of these organisms in the numbers found, and the introduction of pathogenic varieties in this way would not seem great unless it occurred in rinsing the bottles with unsterilized water that had become infected, it being ascertained that some of the bottlers do this.

A fact of great importance was the observation that the CO_2 contained in these aërated waters exerted a deleterious influence upon the organisms. This, of course, varied with different species. Some of the water bacteria were not much affected even after several weeks, but most of them were either destroyed or inhibited in their growth. In the case of the pathogenic varieties experimented with a much greater effect was noticed. The longest period that the spirillum of Asiatic cholera and the spirillum of Finkler and Prior were able to retain their vitality was one hour. The *bacillus typhosis* and *bacillus coli communis* were not certainly destroyed until after a period of at least ten or twelve days, while the *Staphylococcus aureus* held an intermediate position.

From these results it will be seen that aërated waters would be of great value in cases where the water supply was contaminated, and that if the water has been bottled at least two or three weeks would confer immunity in all probability under ordinary circumstances.

W. W. A.

Klein, ——. The Infection of Food-stuffs by Bacteria. Journal of Pathology and Bacteriology, November, 1893.

In London cooked fish and the cut surfaces of cooked meat placed in the larder of a private house rapidly acquired pink patches, which proved on investigation to be due to the development of masses of the *bacillus prodigiosus* with which the articles had become infected.

Upon close investigation it was thought that the microbes had been blown into the larder from an old graveyard that adjoined the premises, which had been torn up at the time the infection suddenly begun.

Although no ill effects followed the eating of the pink food, the incident serves to show the possibilities in this direction. Had the infecting microbes been of a pathogenic character and of a non-chromogenic variety they would doubtless have caused a local epidemic, the true cause of which would probably have escaped detection. May not such an occurrence explain some of the mysterious cases of local outbreaks, particularly of gastro-intestinal disturbances, that are observed from time to time?

W. W. A.

Bates, Dr. The Importance of Bacteriological Examinations in Diphtheria. Report N. Y. City Board of Health.

The presence or absence of the bacillus diphtheriæ is becoming to be generally recognized as the only infallible test, at least in the early stages of the disease, between true diphtheria and other forms of pseudo-membranous angina. It must therefore be conceded that a bacteriological examination is of prime importance at the outset to enable a positive diagnosis to be early made; and in view of the fact, recently pointed out by Dr. Herman Biggs, bacteriologist to the New York Board of Health, that in some cases, particularly where local germicidal treatment has not been properly carried out, the bacilli do not disappear from the throat for some days after convalescence has been established, an examination to determine their disappearance before raising quarantine seems of equal necessity.

To neglect this means of diagnosis and enforce strict quarantine in a case of non-contagious angina would entail much unnecessary hardship and be as unpardonable nearly as to omit measures of quarantine and isolation in doubtful cases of true diphtheria; and to raise quarantine while the bacilli are still present would certainly be hazardous, even though the prescribed time had elapsed.

The New York Board of Health have established a laboratory in which such examinations may be made, and a similar action should be taken by other cities.

W. W. A.

Lenti, P. The Influence of Alcohol, Glycerine, and Oil upon Disinfectants. Modern Medicine and Bacteriological Review, vol. iii, p. 43.

Corrosive sublimate dissolved in absolute alcohol does not destroy spores, even in so strong a solution as 1 to 250, and when in contact with the solution fully forty-eight hours. . . . The only effect observed was the diminution in the virulence of the germs. When 10 per cent. of water was added to the alcohol, a solution of corrosive sublimate 1 to 1,000 rendered the germs innocuous.

A 2 per cent. solution of corrosive sublimate (1 to 50) in pure glycerine had no effect upon germs, even when left in contact for four days. The same result was noted with the addition of 30 per cent. of water; but by increasing the proportion of water to 40 per cent., a solution of corrosive sublimate 2 to 1,000 destroyed spores at the end of twenty-four hours.

A 10 per cent. solution of carbolic acid in alcohol possessed no germicidal properties whatever. The same results were obtained when water was added, even in so large a proportion as 50 per cent. When the proportion of water reached 80 per cent., the germs were destroyed, provided the contact continued for forty-eight hours, but were still alive at the end of twenty-four hours.

A 10 per cent. solution of carbolic acid in pure glycerine was found to be powerless to destroy germs, even when left in contact with them for seventy-two hours. The same result was obtained when the solution contained 10 per cent of water. In order to render the solution at all effective, it was necessary to increase the proportion of water to 80 per cent., and contact for forty-eight hours was then required to completely destroy the germs.

A solution of carbolic acid in pure oil, even in the strength of 20 per cent., was found to be valueless as a germicide.

A 10 per cent. of lysol in oil was found to be equally valueless.

W. W. A.

IDENTITY OF CROUP AND DIPHTHERIA.

Dr. Bates, Chief Inspector of Contagious Diseases in the New York City Department of Health, in a recent report giving the result of his bacteriological work for a period of four months, presents some information relative to the nature of membranous croup which tends to confirm the opinion held by many pathologists that it is a diphtheritic process. Dr. Bates found the Klebs-Loeffler bacillus in thirty out of thirty-six cases of laryngeal croup. In all of these cases the membrane was confined to the larynx.

Conn, Prof. H. W. The Microscope in the Dairy. The Microscope, July, 1894, p. 90.

The author has carried on many experiments in relation to the application of the microscope and our knowledge of micro-organisms to butter-making. The flavor of butter is due almost entirely to certain volatile products making their appearance during the process of ripening the cream. Without this ripening or souring the butter is very tasteless. These volatile products are due to chemical changes produced by the active growth of micro-organisms in the cream. Some species give rise to those exquisitely delicate flavors which are desired in the highest quality of butter, while others give rise to flavors and tastes which are extremely disagreeable, producing butter of the poorest quality that will hardly sell at any price. Several creameries in this country have undertaken the use of pure bacteria cultures for ripening cream, and with universal success. The species of bacteria used by different experimenters do not seem to be the same. This indicates it is possible to get good results by a large variety of bacteria cultures, and that the peculiar aroma of a good quality of butter is a general decomposition product and not one due to any specific bacteria species. It is not found necessary to destroy all the bacteria present in the cream before the addition of the artificial ferment. It is only found necessary to add a large quantity of the artificial culture, and they grow rapidly enough to entirely outweigh the effects produced by the slower growth of other species. The manufacture of these artificial ferments will probably become a commercial industry.

W. H. S.

Georgeson, C. C., Manhattan, Kansas. Bacteriology in the Dairy. Science, vol. xxii, p. 60.

Bacteria affecting our dairy products are either injurious or beneficial. Both classes are present in all dairies, and good butter depends on fostering the beneficial and destroying the injurious. Cold retards the multiplication of bacteria; heat at the boiling point kills them. The Danes have isolated the pure cultures which produce first-class butter, and with artificially grown bacteria give the desired flavor and aroma. There are three or four laboratories from which the prepared cultures are offered for sale. Mr. E. A. Quist, of Skanderborg, uses two forms that singly are ineffective, but together produce a very superior quality of butter.

W. H. S.

Bunting, Martha. The Origin of the Sex Cells in Hydractinia and Podocaryne, and the Development of Hydractinia. Journal of Morphology, vol. ix pp. 203–236. Illustrated. Research Conducted at Woods Holl, Mass.

P. J. van Beneden called a hydroid found on the coast near Ostend in 1841 Hydractinia because he thought it resembled the hydra and the actinia. Louis Agassiz, in 1862, called a form *Hydractinia polyclina*, the reproductive hydroid of which he figured with a mouth, which when seen I found very small. They are found in great abundance on Pagurus shell; around the opening long whip-like zooids; next the nourishing ones; then beyond the reproductive condition. They live on animal food, and sometimes swallow the young of their host as they swam out from the shell. *Podocaryne carnea* was found in the summer of 1890.

The killing re-agents most successful out of the many experimented with were Kleinenberg's "picro-sulfuric" in salt water, and alcoholic corrosive sublimate. The stains that brought out the cell structure in the clearest manner were Mayer's picro-carmine and Kleinenberg's hæmatoxylon.

Conclusions.—The gonophore of Hydractinia arises through the protrusion of the ectoderm and endoderm caused by a multiplication of cells in both layers. The bell nucleus does not originate by invagination, but from a few ectodermal cells that take up a position between the ectoderm and endoderm and increase, forming subsequently two layers of cells.

The ova are first observed in the endoderm of the blastostyle, thus apparently endodermal in origin; reach maturity on the outside wall of the spadix, lying between the endoderm and the inner layer of the bell nucleus. We see that they are, therefore, ectodermal in origin.

The medusa bud of Podocaryne arises as a protrusion of the ectoderm and endoderm, caused by an increase in the cells of both layers. The bell nucleus is formed from ectoderm, not by invagination, but consist at first of a solid plug of cells; later, by a separation of these cells there is formed two layers with an intervening space.

The ova are first seen in the endoderm of the manubrium and they reach maturity in the ectoderm of the manubrium. The spermatozoa arise in the ectoderm of the manubrium and reach maturity in the same position. Thus they are ectodermal in origin.

The ovum of Hydractinia is laid at a definite period of the day; two polar globules are formed; both leave the surface of the egg at the beginning of segmentation; segmentation is total and equal. The endoderm originates through multipolar delamination, beginning at about the sixteen-celled stage, and cells continue to delaminate for some time. By breaking down of endoderm cells the cœlenteric cavity arises; at the same time the two layers are sharply differentiated and the supporting lamella appears. The embryo becomes elongated and ciliated, attached to a substratum by its blunt anterior end. The tentacles appear as solid endodermic outgrowths surrounded by ectoderm. The mouth is formed by the cœlenteric cavity breaking through to the exterior. The hydrorhiza appear first as stolon-like outgrowths; later they become tubular. By lowering the temperature the period of time for the egg-laying and ejection of the spermatozoa may be changed. Blastomeres separated at the two-celled stage develop half planulæ.

W. H. S.

Donaldson, Henry H. Preliminary Observations on Some Changes caused in the Nervous Tissues by Re-agents commonly employed to Harden Them. Journal of Morphology, vol. ix, pp. 123–166.

Normal histological appearances are to be found in animals suddenly killed in full health. Such tissues are not exactly similar; they vary according to age, and rest or fatigue just before death; possibly also other causes. We may consider the changes induced by the usual hardening re-agents, then try to find better.

A sheep's brain in 2½ per cent. solution of potassium bichromate increased in weight 17.8 per cent. the first twenty-four hours, 34.2 per cent. the next five days, and 4 per cent. the next 679 days. It was then hard, of good consistency, but a little brittle. The weight is permanently altered by drainage and not made good by subsequent immersion. Variations in the age of the animal, season of the year, the quality of the water, the amount of air in the jar, and of light are unimportant. The increase of weight is due to absorption of both water and salt. If the pia is not slit or if there is pressure from the sides of the jar, the increase is less.

The general effect of alcohol is to decrease the weight and volume of the sheep's brain at a rate similar to the increase due to potassium bichromate. The higher the per cent. of alcohol, the more rapid and greater the loss in weight. Alcohol of 50 per cent. causes first a slight increase, then a final small decrease. Sodium sulphate added to potassium bichromate diminishes the increase. Nitric acid 2 per cent., S. G. 1.42, causes little change. Zinc chloride, a saturated alcoholic solution, causes almost as much loss of weight as alcohol. The changes in the brain of a shark are similar to those of the sheep. Numerous experiments on human brains show similar results. The final change in specimens treated with a mixture of equal volumes of 4 per cent. potassium bichromate and alcohol 95 per cent. is slight; also 50 per cent. alcohol and likewise a saturated solution of sodium chloride disturb the normal weight but slightly.

W. H. S.

Dean, Bashford. The Marine Biological Stations of Europe, pp. 211–234. Tenth biological lecture at Woods Holl. Biological Lectures, vol. ii. Ginn & Co., Boston, Mass.

The marine laboratory has become the university of the investigator. The entire coast line of Europe is dotted with stations supported by societies, individuals, and governments. The interior universities, remote from the coast, are supplied with fresh material sent regularly from the stations, either living or preserved in the best manner. The studies in pure biology prosecuted therein have given important aid to practical fish culture, as well as to the solution of problems of evolution and heredity. The number and nationality of the stations is as follows: In France the governmental stations of Roscoff, in Brittany, and Banyuls, on the Mediterranean; Wimereux, near Boulogne, Professor Giard; Cette, Professor Sabatier; Marseilles and Ville-Franche, the latter Russian, and Arcachon. In England, at Plymouth, Prof. Ray Lancaster; Liverpool, St. Andrews and Dunbar, the Isle of Man, and a new one in the Channel islands. These stations are obliged to devote some attention to practical fisheries to secure support. In Holland, at the Helder, Professor Hoels. Italy, Naples, Professor Dohrn; Messina, Professor Kleinenberg; Istria, Rovigne, and Trieste, Dr. Graeffe; Germany, Heligoland and Kiel; Norway, at Bergen and Drobak; Sweden, near Gothenberg; Russia, at Sebastopol and Solovetsky, on the White sea, the last the only laboratory that commands an arctic fauna. There are twenty-five in all.
W. H. S.

Julien, Alexis A. Suggestions in Microscopical Technique. Journal N. Y. Microscopical Society, vol. ix, pp. 23–43.

The author calls attention to certain details of technique which are of the utmost importance to the successful preparation of organic structures, and demonstrates that success of investigation and teaching largely depends upon approximately perfect preservation of tissues in the form of mounted preparations. The desirability of skillful staining, the result of experiment of the most suitable staining agents and mounting media, perfectly adapted methods of illumination—in brief, the most favorable and suitable examination after careful methods of preparation—is contrasted with the too frequent examination of a hastily cut and poorly stained (or many times unstained) piece of tissue.

The chief object in the making of all scientific preparations should be the retention and revelation of its true structure, its most minute details, and not merely the beauty of finish or the preservation of a merely artistic slide. He calls attention to the fact that the finishing and labeling of a permanent mount is frequently the index of the degree of care and skill which the preparer has bestowed upon the preparation of the object, and represents largely its true worth. It is with these points in view that the writer calls attention to the following suggestions for a more perfect technique, and insists that no pains can be taken too great for the proper and perfect completion of a tissue and mounting.

The first convenient apparatus is a—

I. *Carrier of Cover Impressions.*—It is extremely useful for the collection of cover impressions of organisms while in the field or in the clinic-room, and does away with the necessity of drying, filming, and packing away between separate disks of paper, as is commonly practiced. They can be stored immediately, while still moist, and carried with safety without adherence, abrasion of film, or fracture of the covers. The cover-glass carrier is simply a cork cemented to the bottom of a round pasteboard box, in the center, and encircled by a fine but weak spiral spring. A thin, loose roll of Japanese paper against the inner side of the box prevents dislodgment of the covers inserted in the coils of the spring. The box when covered can easily be carried in the pocket.

II. In place of the small brass mounting table used by the microscopist for a great variety of purposes the writer suggests one having the advantages—economy, by reason of the very small jet employed; portable and adjustable, being easily taken apart, and convenient, by reason of the long retention of heat in the sand bath attached beneath the mounting plate; affords support for evaporation of small films for gentle warming and digesting. He converts the burner into a minute Bunsen burner an inch in length by slipping over the nipple a little tube of brass foil or brass tubing of about six millimeters diameter, with two small holes near the bottom, as in the Bunsen burner.

The flame obtained is blue, hot, and clean; well suited for ordinary heating processes, cleansing soiled points of mounting implements without soot, and especially useful in drying the films of bacteria upon covers.

Instead of passing them, as is commonly and roughly done, through the huge flame of an ordinary Bunsen burner at a speed of "a knife cutting bread," the covers are laid upon the mounting plate, say, five seconds, at a height of five centimeters above the miniature Bunsen burner with a flame one centimeter in height, or, if preferable, directly over the flame, at a greater height for a few seconds. The heating is far more uniform ; the films are well dried, and more satisfactory results may be insured in subsequent staining. He discourages the practice of warming a thin cover with its film containing very minute organisms over a rush of flame seven or more inches in height.

III. *Staining Flask.*—After describing the more commonly employed methods of staining films upon cover-glasses, as bacteria, blood, etc., and pointing out the imperfect or erroneous results of inexperienced workers by the overheating of the stain, evaporation of the stain, and deposit of crystals upon the specimen, he offers the following simple apparatus for use in laboratories :

A tight coiled-spring as a cover-holder (same principle as employed in section I), in which a large number of these covers may be clamped, made of fine brass, copper, or steel wire (not coarser than 26 gauge) wound on a ¼-inch mandrel. It is best made of fine platinum wire. The wire at one end is bent into a little loop for suspension.

A small, wide-mouth specimen jar to hold the staining solution, and having a capacity of about 40 cc., and a mouth aperture of at least 2 cm. Fit to this a wide cork, through which runs a pin or bent wire in hook form, upon which hangs the coil of wire. When in use keep filled about two-thirds full with the staining solution.

A somewhat similar, but glass-stoppered bottle, same aperture as specimen flask, to hold a second or moderate solution.

The covers are first tightly inserted in the coil of wire, films downward, and suspended from the cork. The stain, if necessary, is first brought to the desired temperature by heating over a flame. The cork is then inserted, seeing to it that the covers are entirely submerged. The stain is then governed by the required time and necessary amount of heat to suit the particular case. A large number of covers may be stained in this manner at one time. In like manner the entire coil with covers is passed through successive beakers of distilled water and thoroughly washed, etc. This method answers admirably when there is a need for long and slow staining in cold solutions. Another advantage in handling thin covers in mass by this method is that the risk of liability of breakage is greatly diminished.

IV. Regarding the precautions necessary to avoid air bubbles in mounts, Professor Julien defines the following as practiced in his laboratory:

1. As the air film can be removed by friction, all plain slides and interior of cells are briskly rubbed just before using.

2. Glass covers are thoroughly cleaned at one time by immersion in Seiler's solution (1 part sat. sol. potass. dichrom. in 3 parts of conc. sulphuric acid) about an hour, thoroughly washed in distilled water, and immersed in strong alcohol. Before using, each cover removed, well-rubbed, dried, and placed on a warm mounting table, when it is chemically and microscopically clean.

3. All preservatives are kept slightly warmed before use.

V. For laboratories where a constant and large supply (especially in bacteriological research) of water—distilled and free from air—is desired, the author finds the following apparatus of great service: A cylinder can of copper or tin, any desired capacity, is covered with a tightly fitting cap, which should be removable to allow of cleaning.

In the center of the cap an automatic escape valve for steam is inserted. After the can is scalded and absolutely clean, it is nearly filled with distilled water and heated to boiling over a Bunsen. While steam is actively escaping from the valve a wad of sterilized cotton is wrapped about the valve. The wad is wired down and the supply pipe protected from dust by filter paper. When sterilized water is needed, it is only necessary to flame the end of the supply pipe and open the faucet.

VI. In this section, devoted to "Mounting Medium for Algæ and Fungi," the author has made a very critical survey of the methods commonly practiced for the preservation of the natural appearances of formed non-contractile materials, the permanent preservation of living contractile tissues, and points out the limited degree of success of the large majority of microscopists in the use of reagents upon these delicate structures. His own laboratory experience is cited, and his conclusion, based upon a large variety of preservatives in common use upon different tissues, is set forth, the results being founded upon an examination of several hundred mounted preparations of objects during a period of fifteen years

The section is devoted to the alteration by change of natural conditions or by death; the contraction by chemical reaction; the contraction by absorption of water; the disintegration by bacteria and minute infusorians. Formulæ are cited, having special value for:

A. Organisms with delicate walls and rather thin and watery endoplasm;

B. Organisms with endoplasm of ordinary density; and

C. Organisms with apparently dense endoplasm.

VII. The value of the materials commonly used for cell-construction is discussed in this section, particularly shellac, gold-size, Bell's cement, copal, and zinc. The various objections to all the above materials are stated, and then the attention is directed to the employment of balsam-paraffin for cells, the method of employment being carefully described in detail.

Balsam paraffin consists of the hardest paraffin that can be obtained, to which is added about 5 per cent. of Canada balsam. When used it is just melted on the warming-table, and cells of any depth spun with a brush on the turn-table in the usual way. They are ready for immediate use, do not dim the cover-glass like wax cells, and may be used for any preservatives not solvents of paraffin, such as oils. Before the object and preserving liquid are put in the cell a film of liquid marine glue is run on top of the ring, then the object inserted, the cover pressed down, the excess of fluid absorbed by blotting paper, and a seal of paraffin run on; then any desired finish. The slide is thus completed at once.

J. M. L.

NOTICES OF SOME RECENT WORKS.

Minot, Charles Sedgwick. Human Embryology. 463 Illustrations, pp. 815. N. Y, Wm. Wood & Co., 1892.

Although this work may not be exactly recent, it is noted here because it is undoubtedly the most complete and thorough work that has yet appeared in that branch of microscopical science called embryology. It begins with the uterus, and adopts the historical method of treatment so far as is necessary to an understanding of the changes that have taken place in the views of scientific observers on the subjects treated of. Frequent references are made to the